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EMBRYOLOGY.[1]

On the Fœtal Membranes of Testudinata.—Dr. K. Mitsukuri has published an elaborate paper in the Journal of the College of Science, Imperial University of Japan (Vol. IV., pt. 1), on the fœtal membranes of the turtle. The contribution is a paper of fifty pages, with ten excellent plates. The amnion arises from an anterior and two lateral folds,—there is no posterior fold,—and these extend gradually from before backwards. The lateral folds meet above the embryo, but their cavities do not unite across, so that a connection between the amnion (proper) and the serous envelope—sero-amniotic connection—always remains along the line of union. The backward growth of the amniotic folds over the embryo does not stop at the posterior end, but continues to grow backward, although diminished in width, until finally there is produced a tube extending from the posterior end of the embryo, reaching a length as great as the embryo itself, and placing the cavity of the amnion into communication with the exterior.

In the Testudinata the allantois arises as a diverticulum from the posterior region of the midgut, and is from the first continuous with it. The later stages of the fœtal membranes are more complicated. The allantois is obstructed in its growth over the embryo by the sero-amniotic connection. Ultimately the allantois surrounds the yolk by means of its three lobes. "There is always, even in very much advanced eggs, a small mass of the white just at the point where the three lobes of the allantois meet at the lower pole." It seems that we have here, in a very primitive condition, the structure described by Duval as the placenta of birds. The yolk-sac passes into the interior of the body in hatching, where it lies for a long time, and may be found in young tortoises late in the spring of the year following.

Mitsukuri thinks that if the embryology of the groups of reptiles and birds are carefully gone over again many structures which are highly significant in the light of facts now obtained will be found to have hitherto escaped notice; for instance, the sero-amniotic connection and the posterior tube of the amnion. The amnion was probably developed originally by mechanical causes. In Testiudinata, when the head fold is produced, there are two reasons why it should sink into the yolk; "first, the yolk is very large and liquid, especially beneath the blastoderm; and, in the second place, the white disappears from over the blastoderm, which then adheres firmly to the shell-membrane, hence there is no space for the head fold to grow, except towards below."

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[1] Edited by Thomas H. Morgan, Johns Hopkins University, Baltimore, Md.

The Placenta of Rodents.—Duval has published a paper in the *Journal de l'Anatomie*[2] giving a clear and interesting account of the discovery of the "inversion" of the germ-layers of rodents, adding a theory of the method by which this curious process has been brought about, and illustrating the whole by an admirable series of diagrams.

With Bischoff (1842) the problem of the inversion originated, and its solution has gradually, since then, been worked out. We may pass through a series of forms showing the condition of inversion in its various stages,—in the hare, where it is simplest, through the field-mouse, rat, and mouse, to the guinea-pig, where it is most complicated. Unfortunately the early investigators began with the last form, and it is rather surprising they made as much as they did out of the process; indeed, Duval believes that, although often in error, Bischoff guessed the fundamental meaning of the phenomenon, and had a better knowledge of the process than some of the investigators that came after him.

Primarily the sinking of the blastodermic portion of the embryonic vesicle has been the cause of the inversion of the layers. This was closely connected with the formation of the ectodermic amnion which arches up over the embryo as the latter sinks into the vesicle. By the closure of the amnion above there is formed a cavity lined by ectoderm, which, owing to the sinking of the embryo, lies, as it were, in the center of the vesicle, but still *above* the embryo. This process takes place in its simplest form in the hare, but in the other rodents it takes place by an abbreviated condition; for the amniotic (ectodermic) space first appears as a *split* in the thickened ectoderm above the blastoderm. Subsequently the cavity of the amnion is divided into two parts, an upper and a lower, by a constriction formed in the middle. This division the author believes primarily to have taken place by the early development of the allantois in order that it might spread out under the upper (attached) pole of the embryo. In many forms the amnion divides into its two parts before the appearance of the allantois, and this is but a *precocious* process, caused in the first instance by the growth of the allantois.

On the Morphology of the Bilateral Ciliated Bands of the Echinoderm Larvæ.[1]—In a previous work (Die Entwickelung der Synapta digitata (*Jen. Zeit.*, XXII.) the author refers to the preoral ciliated band as arising from the adoral band (surrounding the mouth), and not from the other ciliated band, from which it is entirely separated, thus opposing the older view of Gegenbaur, adopted by Korschelt and Heider in their Lehrbuch.

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[2] XXVI. Anne., No. 6, 1891.

[1] R. Semon, *Jenaische Zeitschrift*, XXV. (N. F., XVIII.), 1890.

But the author's present work, begun in April, 1890, at Helgoland, shows that the adoral band arises without connection with the preoral band, and that the union of their edges is secondary. Thus ontogenetically is given striking proof of the correctness of Gegenbaur's supposition.

The stage where but a single ciliated band is present is called the Auricularia stage of the Bipinnaria.

In older larvæ the postoral and preoral portions of the longitudinal (circumoral) ciliated band unite at the preoral apical pole, and form a median unpaired stripe. Later, on a plane parallel to the ventral surface, this median unpaired stripe divides, and thus forms the preoral and postoral ciliated bands of the Bipinnaria.

The ciliated bands are formed by a loss of cilia and flattening of the cells over the rest of the body, thus leaving the bands as the only ciliated part. This process begins on the ventral side; the cilia disappear last at the apical pole.

The adoral ciliated band is formed in a similar way, and at its anterior part comes into close relation, secondarily, with the preoral band.

Thus is solved the only difficulty to Joh. Müller's plan to derive the body form and arrangement of the ciliated bands for all Dipleurula larvæ from a fundamental type, since it is shown that the Asterid larva passes through an Auricularia stage, and that the preoral ciliated band is separated from an ancestral single ciliated band. This stage with a single ciliated band is the typical form, ontogenetically reproduced in sufficiently young larvæ of all classes of Echinoderms.

The author notes as an interesting fact that in Joh. Müller's comparison the Ophiurid pluteus, by the increase of the posterior dorsoventral bendings (auriculæ of the Auricularia and Bipinnaria), to long and characteristic projections, in this important point stands nearer the typical form than the Echinid pluteus to which in other respects it is more comparable.

He points out the close relation existing in all larvæ between the upper transverse border of the preoral band and the adoral ciliated band. He believes that the Dipleurula larva cannot be traced back to the *typical trochophore* with *preoral ciliated rings;* probably not to the *mesotrochal* larva; possibly it may be compared to a *telotrochal* larva, but it must be shown that the bands arise in a similar way in each. This is only a tentative suggestion.

In Tornaria the arrangement of two longitudinal ciliated bands agrees throughout with the Asterid larva, as does also its internal development (cœlom sacks). Still, on account of the differences in the mature animals, it is difficult to show more than a very distant genetic relationship.

As a result of these observations, we believe that the Dipleurula larva, including Tornaria, are separated from the cilia-bearing larvæ of the higher and lower worms, as well as molluscs. An homologizing of the circumoral ciliated bands of Echinoderms with the cilia apparatus of the other larval types cannot be carried out. They probably are structures independently arising. The results on the nervous system of Asterid and Echinid larva were negative.

The author speaks of a bilateral fibre-system, united by a cross commissure, lying in the dorsal skin under the epithelium. It seems to take the place of a nervous system, and its structure recalls that of nervous tissue. The thicker fibres cannot be distinguished from the muscle fibres of the foregut, perhaps a little less transparent and certainly more branched. This may be regarded as a well-developed dermal musculature.—GEORGE W. FIELD.

PSYCHOLOGY.

Note on Imperfect Instinct in Animals.—On a number of occasions I have observed that the instinct of animals is sometimes shown to be imperfect, and reading Mr. George J. Romanes's book on "Mental Evolution in Animals," where mention is made of "imperfection of instinct" (page 167), his illustrations quoted recall to my mind some original observations which might add still further to the interest of this subject. Regarding insects, on July 4th, 1887, I noticed among the fireworks displayed upon an open stand, on the corner of a vacant lot in Chicago, a number of bunches of different-sized fire-crackers with their bright crimson covers conspicuously distributed among the other pieces of similar explosives. While I was standing close by a pretty, bright, reddish-brown butterfly, with silver spots on the under surface of the wings, which I supposed to be the larger species of Argynnis, came flying along near